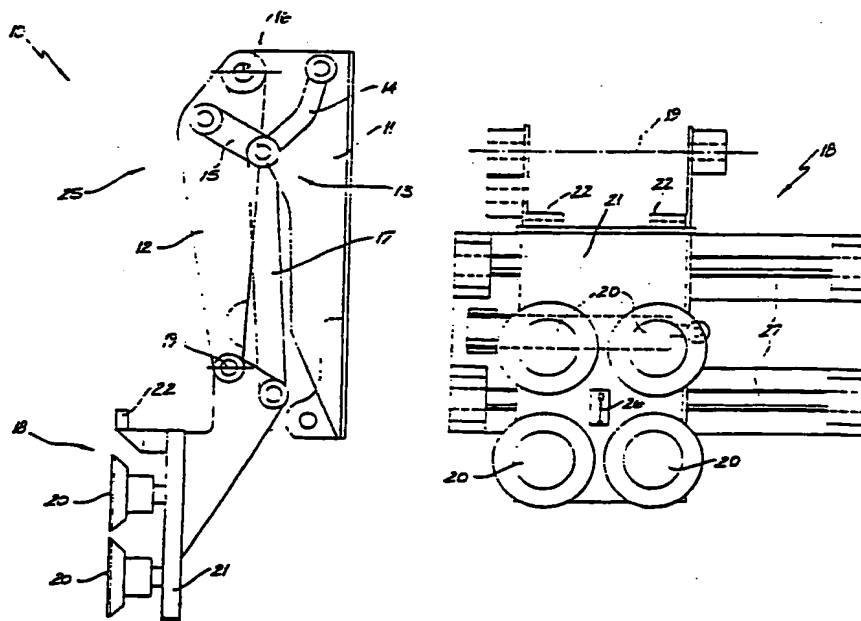




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>5</sup> :</b>  <b>B65F 3/02, 3/04</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 91/05721</b>  <b>(43) International Publication Date:</b> <b>2 May 1991 (02.05.91)</b>
<b>(21) International Application Number:</b> PCT/AU90/00488 <b>(22) International Filing Date:</b> 12 October 1990 (12.10.90) <b>(30) Priority data:</b> PJ 6835                      12 October 1989 (12.10.89)      AU <b>(71) Applicant (for all designated States except US):</b> STEVELIFT PTY LTD [AU/AU]; Farm 20, Corbie Hill, Leeton, NSW 2705 (AU). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only) :</b> GUEST, Stephen, John [AU/AU]; Farm 20, Corbie Hill, Leeton, NSW 2705 (AU). <b>(74) Agent:</b> SPRUSON & FERGUSON; G.P.O. Box 3898, Syd- ney, NSW 2001 (AU).		<b>(81) Designated States:</b> AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), GR, GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (Euro- pean patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.  <b>Published</b> <i>With international search report.</i>

**(54) Title:** LIFTING APPARATUS**(57) Abstract**

A lifting apparatus (10) to be attached to the side of a garbage collection truck. The apparatus comprises a series of linkages (12, 14, 15, 17, 18) mounted to a mounting member (11) attached to the vehicle. A plurality of suction cups (20) is provided on a garbage bin securing member (18). A vacuum supply to the suction cups is actuated by means of a trip switch (26) mounted adjacent to the suction cups. The trip switch (26) is activated as it abuts the side of a garbage bin. The vacuum supply is disconnected as the bin securing member (18) returns past a predetermined position. In a preferred embodiment, the securing member (18) is mounted on lateral shift rails (27) to allow for positional adjustment of the bin securing member (18) relative to the bin. The apparatus is adapted to raise a garbage bin from a position generally adjacent the truck to a raised and inverted position adjacent to an entry chute of a garbage compactor of the garbage truck.

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LIFTING APPARATUS

The present invention relates to a garbage bin lifting means for garbage collection vehicles.

Present garbage trucks use hydraulically operated securing means to lift garbage bins. Such securing means comprise mechanical arms attached to main lifting arms which are adapted to grab mobile garbage bins such as "rapid-rails", "otto" bins etc. The arms move to a predetermined position with respect to the bin and, when the main lifting arm is raised, they engage a circumferential ridge portion of the bin.

The bin is lifted by the main lifting arms until it is held up-side down over the entry chute of the garbage bin truck compactor. The bin is prevented from slipping off the arms of the lifting means by a retaining portion on the securing means.

These known types of garbage bin lifting apparatus are not adapted for picking up both common available 120 litre and 240 litre sized bins. That is, known lifting apparatus is usually only adapted to lift one size of bin.

Further, the cycle time for this type of lifting apparatus is relatively long since the action of the arms can be quite slow.

It is the object of the present invention to overcome or substantially ameliorate the problems and/or disadvantages of the prior art.

In one broad form the present invention provides apparatus comprising: lifting means to be attached to a vehicle,

object securing means mounted to said lifting means so as to be lifted thereby,

said lifting means being moveable between a retracted position wherein said object securing means is located adjacent an object to be lifted and an extended position wherein said object securing means is in a raised, essentially inverted position, and

wherein said object securing means comprises suction fastening means connected to a vacuum supply and switch means adapted to be activated or deactivated at a predetermined position during movement of said lifting means so as to supply or disconnect said vacuum.

A preferred form of the present invention will now be described by way of example with reference to the accompanying drawings, wherein:

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Figure 1 is a side elevational view of the lifting apparatus of the present invention in a folded configuration,

Figure 2 is a side elevational view of the apparatus of Figure 1 in a mid-way position of the lifting means,

Figure 3 is a side elevational view of the apparatus of Figure 1 in a fully raised position,

Figure 4 is a side elevational view of an alternative embodiment of the lifting apparatus of the present invention,

Figure 5 is a front elevational view of the apparatus of Figure 4, and

Figure 6 is a plan view of the apparatus of Figures 4 and 5.

In the accompanying drawings, there is schematically depicted a lifting apparatus 10 to be mounted to a garbage truck (not shown) having a garbage compactor. Preferably, the lifting apparatus 10 is used in conjunction with a garbage truck adapted for control by a single operator.

The lifting apparatus 10 comprises a lifting mechanism 25 which comprises a mounting member 11 to be attached to a side of the truck in a generally vertical position adjacent to the entry chute of the compactor.

Pivotaly mounted to the mounting member 11 proximate its top end is the lifting arm 12 which is movable relative to the member 11 between a retracted position (see Figure 1) generally coextensive and parallel to the mounting member 11, and a fully extended position (see Figure 3). Figure 2 shows the lifting arm 12 in a mid-way position.

Pivotaly mounted to the other end of the lifting arm 12 is a bin securing apparatus 18 which is adapted to releasably retain a bin when the lifting arm 12 is being raised and lowered.

A linkage arrangement 13 is also provided so that the bin which is being lifted by the lifting apparatus 10 is kept generally upright until it is over the entry chute of the compactor. This is necessary to prevent the garbage within the bin from being discharged before arriving at an appropriate position relative to the truck.

The linkage arrangement 13 comprises a first member 14 pivotaly mounted to the mounting member 11 at a position spaced from the pivotal axis 16 of the lifting arm 12 to the mounting member 11; a second member 15 pivotaly mounted to the lifting arm 12 at a position spaced from the axis 16, and a third member 17 pivotaly mounted to the bin securing apparatus 18 at a position spaced from the pivotal axis 19 between the apparatus 18 and the lifting arm 12.

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The second and third members 15, 17, the lifting arm 12 and the bin securing apparatus 18 are connected in such a way so as to generally define a parallelogram linkage which maintains a particular orientation of the securing apparatus 18 relative to the ground within a certain range of movement of the lifting arm 12. After this range of movement of the lifting arm 12 is exceeded, the first member 14 causes the apparatus 18 to pivot with respect to the lifting arm 12 as it completes its rotation about the mounting member 11 into the fully raised position (see Figure 3).

In addition to bin lip support blocks 22 which are adapted to catch under a peripheral lip of a bin to be lifted, the bin securing apparatus 18 comprises two or four for example suction cups 20 which are mounted to a straight face 21 of the apparatus 18. When the lifting arm 12 is in the folded position, the suction cups 20 face outwards from the truck and are aligned generally vertically.

Communicating with each of the suction cups 20 is an air hose (not shown) which are each connected to a vacuum supply via an air operated trip switch 26.

In accordance with a further embodiment of the present invention, the bin securing apparatus 18 comprises a number of shift rails 27. In this particular embodiment, the straight face 21 is mounted to the shift rails 27 by means of linear bearings 28. Such a configuration allows for lateral transfer of the suction cups 20 to compensate for any inaccuracy of the garbage truck in its parked relationship to the bin to be lifted. Shift cylinder 29 is provided as a means by which a shifting force is applied to the bin securing apparatus 18 so as to be transferred along shift rails 27.

In use, the lifting arm 12 is moved away from the folded position which activates the air operated trip switch 26 so as to provide a vacuum to each of the suction cups 20. In the embodiment depicted, the trip switch 26 activates as it engages with the side of the bin to be lifted.

The suction cups 20 are initially adjacent the bin. A projection 22 also projects from the face 21 of the apparatus 18, which is positioned to butt up against the side face of the bin while it is adhered to the apparatus 18.

The suction cups 20 engage a side face of the bin and adhere thereto allowing the bin to be lifted by further pivoting motion of the lifting arm 12 towards the extended position. When the lifting arm 12 is in the fully extended position, the garbage within the bin is emptied into the garbage compactor.

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After the bin has been emptied, the lifting arm 12 is moved back towards the folded position. When the lifting arm 12 reaches the folded position, the air operated trip switch 26 closes off the vacuum to the suction caps 20 thus allowing the bin to be released and placed back onto the ground.

Typically, the cycle time of the present invention is approximately 3 to 6 seconds from the initial folded position to the bin-empty and back to rest (folded position).

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The claims defining the invention are as follows:

1. Apparatus comprising:  
lifting means to be attached to a vehicle,  
object securing means mounted to said lifting means so as to be lifted thereby,  
said lifting means being moveable between a retracted position wherein said object securing means is located adjacent an object to be lifted and an extended position wherein said object securing means is in a raised, essentially inverted position, and  
wherein said object securing means comprises suction fastening means connected to a vacuum supply and a switch means adapted to be activated or deactivated at a predetermined position during movement of said lifting means so as to supply or disconnect said vacuum.
2. Apparatus according to claim 1 wherein said lifting means comprises a mounting member to be attached to a side of said vehicle in a generally vertical orientation.
3. Apparatus of claim 2 wherein said lifting means comprises a lifting arm pivotally mounted proximate a top end of said mounting member, the lifting arm being moveable relative to the mounting member between said retracted and extended positions such that in said retracted position, said lifting arm is generally co-extensive and parallel with the mounting member.
4. Apparatus as claimed in claim 3 further comprising a first member pivotally mounted to said mounting member at a position spaced from a pivotal axis of the lifting arm to the mounting member, a second member pivotally mounted to the lifting arm at a position spaced from the said axis, and a third member pivotally mounted to the object securing means at a position spaced from a pivotal axis between the bin securing means and the lifting arm.
5. Apparatus according to claim 4 wherein the lifting arm and the object securing means are connected in such a way so as to generally define a parallelogram linkage which maintains a particular orientation of the object securing means relative to the ground within a predetermined range of movement of the lifting arm.
6. Apparatus according to claim 1 wherein said suction fastening means comprises a plurality of suction cups.

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7. Apparatus of claim 6 wherein in said retracted position, the suction cups face outwards from said vehicle and are aligned essentially vertically.

8. Apparatus of claim 6 wherein there is attached to each of said plurality of suction cups an air hose, each connected to a vacuum supply via an air operated trip switch.

9. Apparatus of claim 8 wherein said trip switch is located in a position adjacent said suction cups so as to be activated by contact with said object to be lifted.

10. Apparatus as claimed in claim 6 wherein said object securing means further comprises at least one shift rail onto which the suction cups are mounted by way of a face member which is adapted to slide laterally along said shift rails.



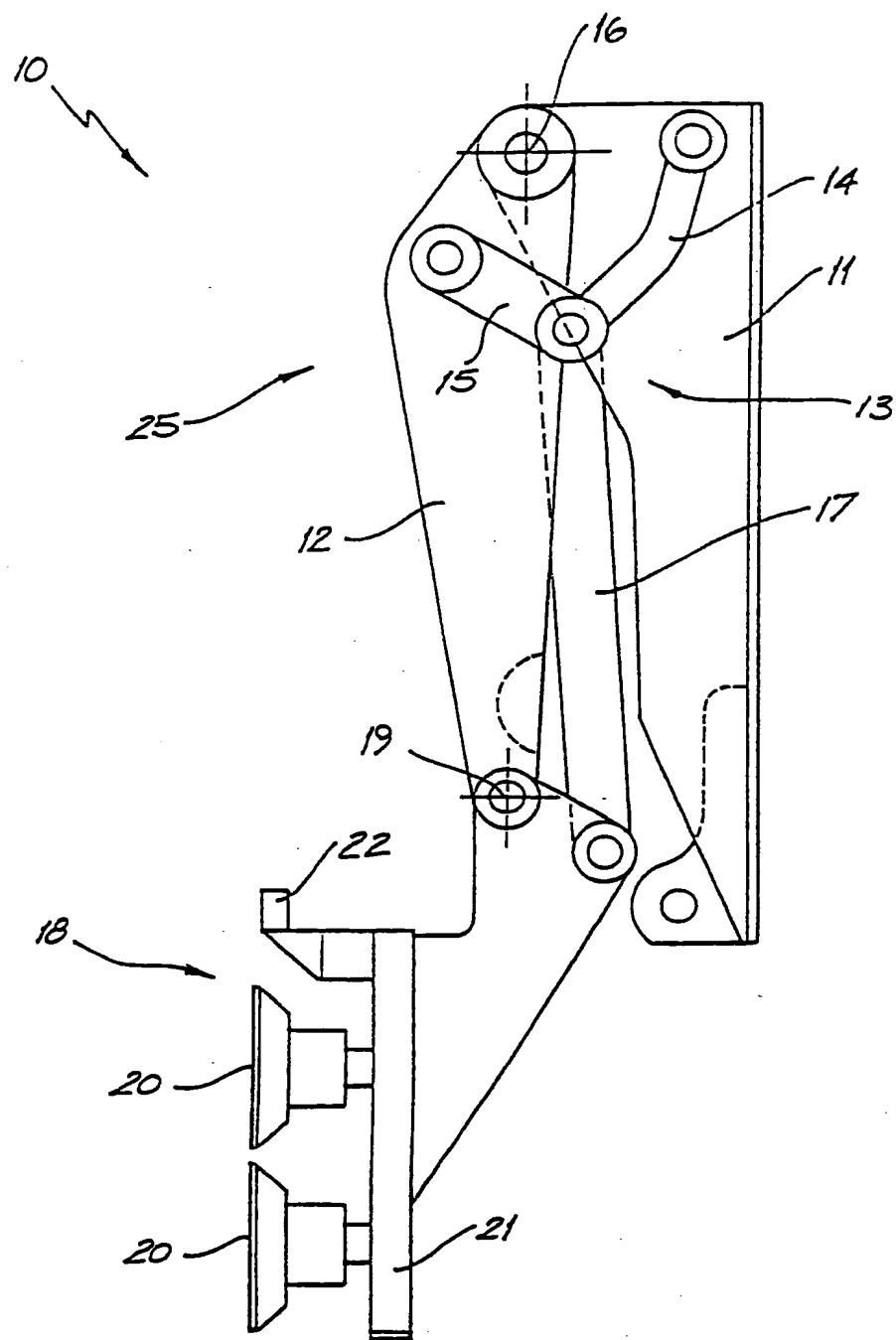


FIG. 1

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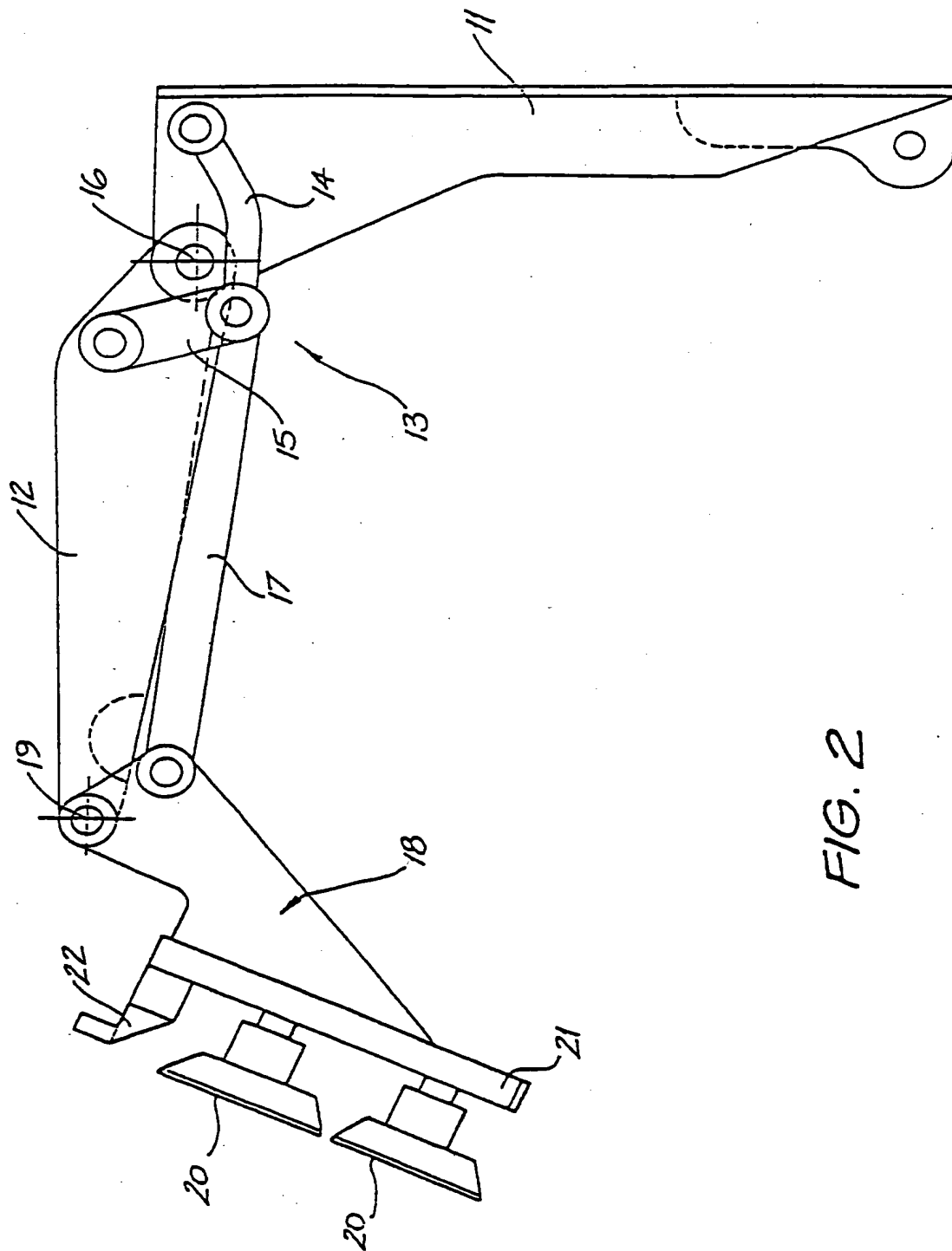


FIG. 2

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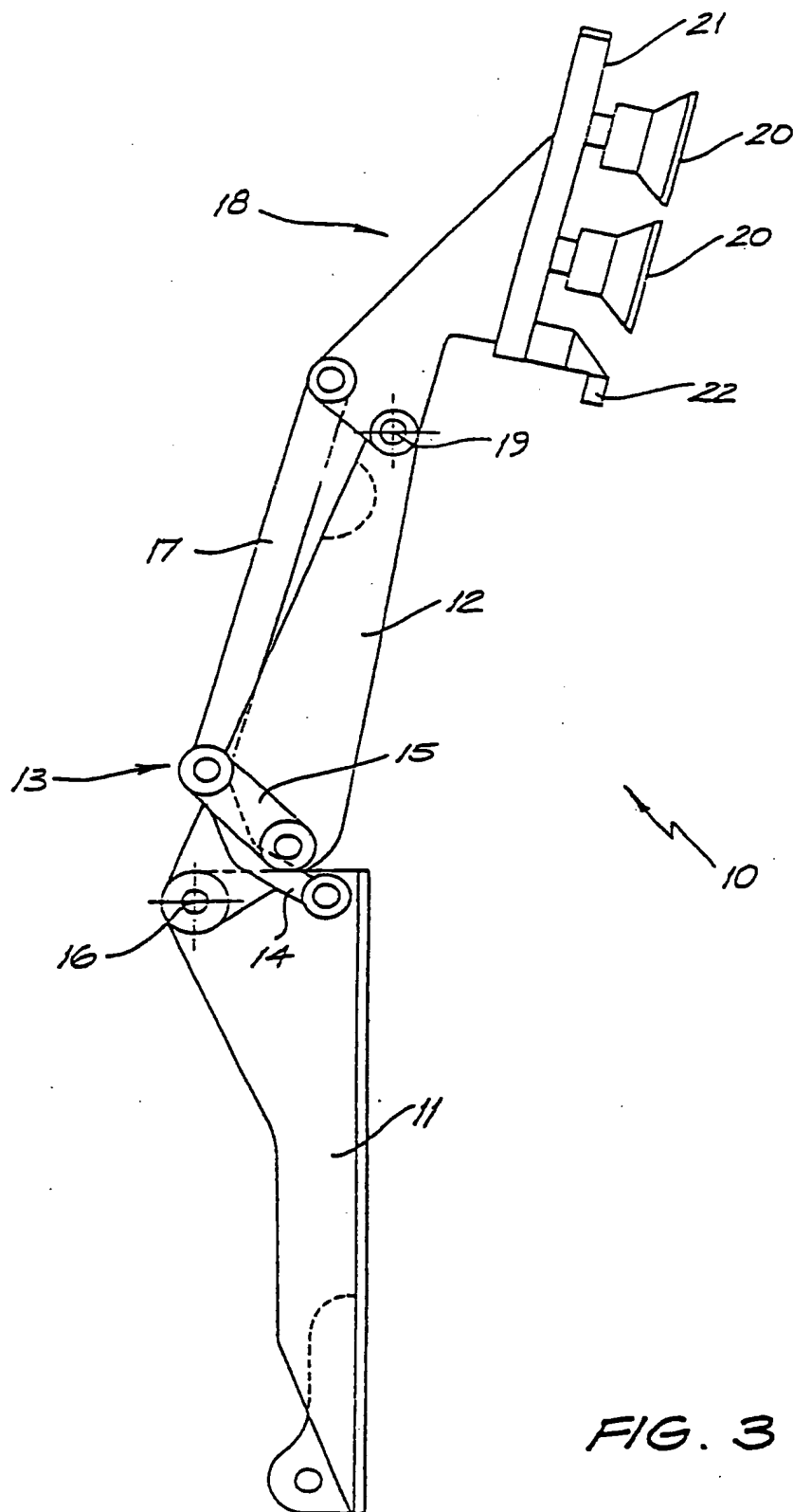


FIG. 3

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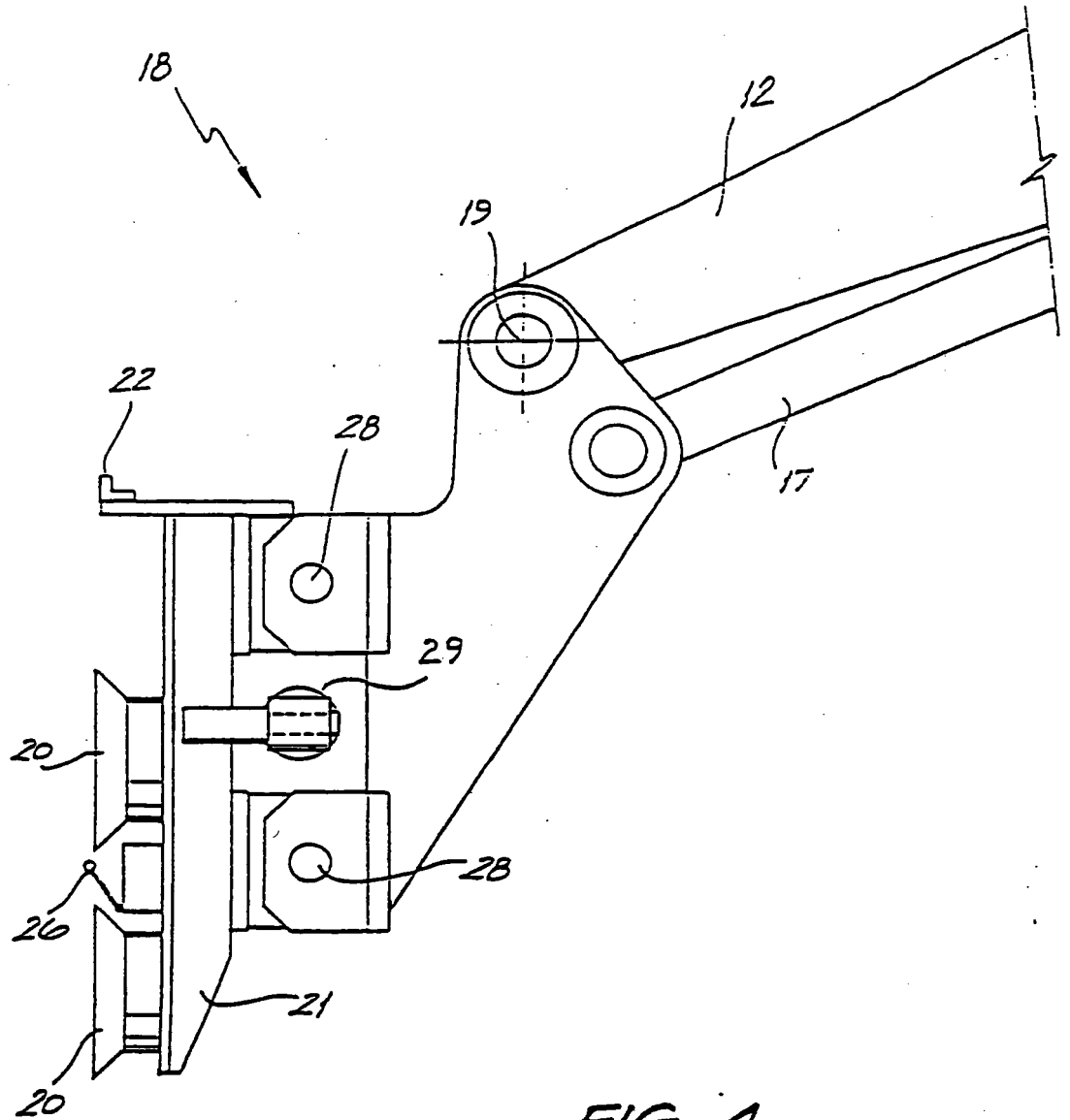


FIG. 4

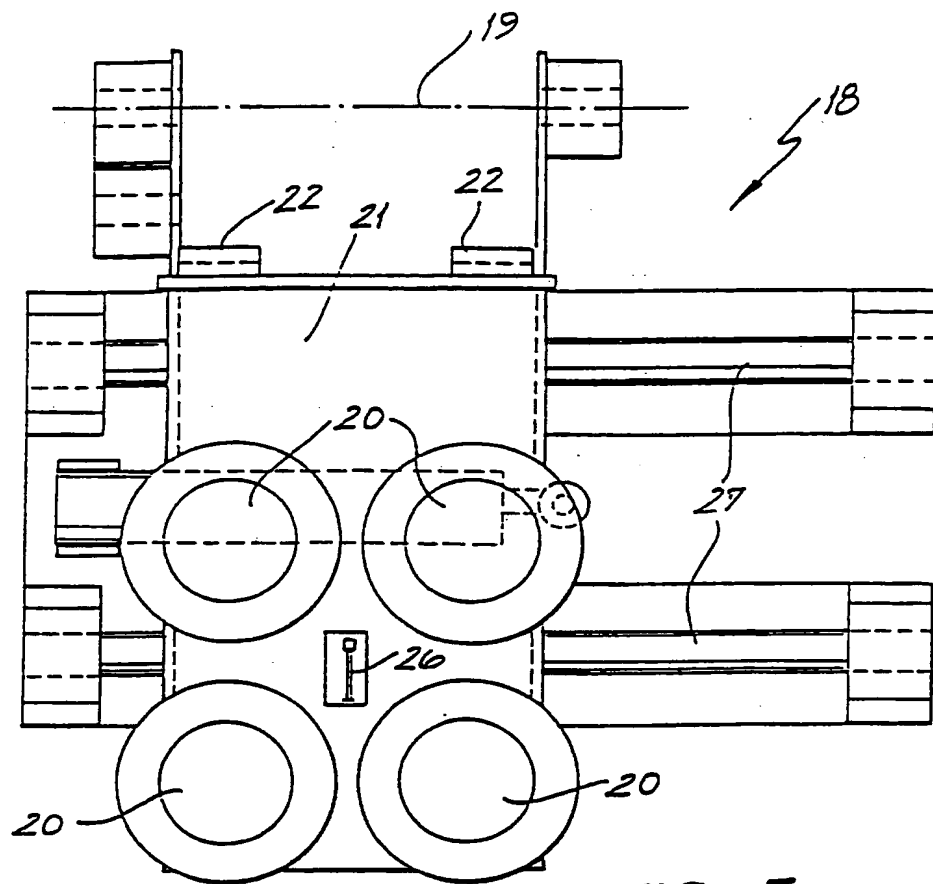


FIG. 5

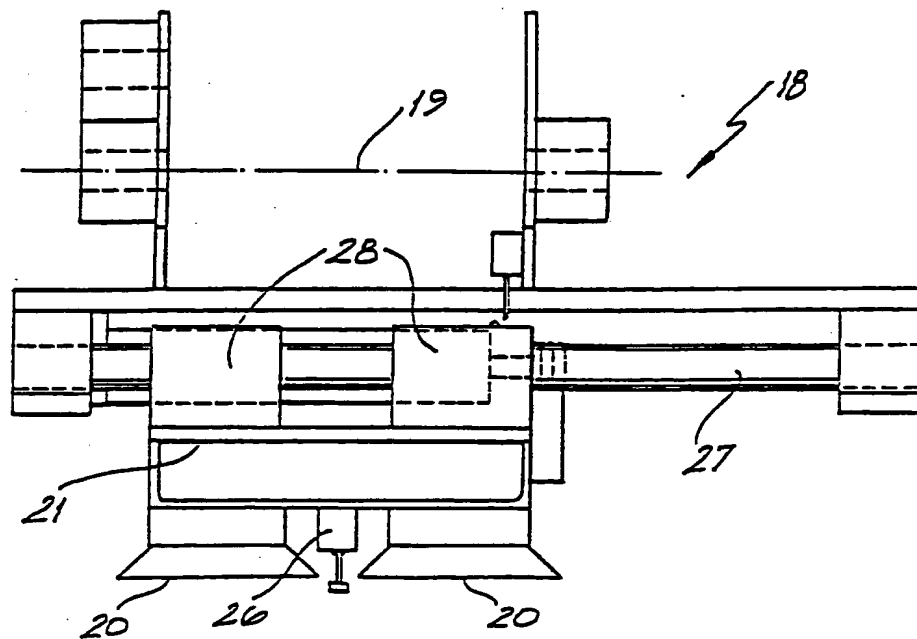
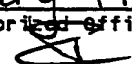


FIG. 6

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) 6		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int <sup>5</sup> B65F 3/02, 3/04		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched 7		
Classification System	Classification Symbols	
IPC	B65F 3/02, 3/04	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 8		
AU : IPC as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> 9		
Category*	Citation of Document, with indication, where appropriate, of the relevant passages 12	Relevant to Claim No 13
X	EP,A, 287433 (SEMAT SOCIETE ANONYME) 19 October 1988 (19.10.88) See the entire document	(1-10)
X Y	EP,A, 327948 (EDELHOFF POLYTECHNIK GMBH & CO.) 16 August 1989 (16.08.89) See the entire document	(1,6,7) (2-5,8-10)
Y	DE,A, 3106333 (ZOLLER-KIPPER GMBH) 23 December 1982 (23.12.82) See the entire document	(1-10)
Y	DE,A, 2920900 (STRATMANN) 4 December 1980 (04.12.80) See the entire document	(1-10)
Y	AU,A, 21063/88 (JAYRICH ENGINEERING PTY LTD) 23 February 1989 (23.02.89) See the entire document	(1-10)
(continued)		
<p>* Special categories of cited documents: 10</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search 22 January 1991 (22.01.91)		Date of Mailing of this International Search Report 30 January 1991
International Searching Authority Australian Patent Office		Signature of Authorized Officer  P. WARD

## FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

Y	US,A, 2949199 (JONES) 16 August 1960 (16.08.60) See the Figs and claims	(1-10)
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## V. [ ] OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE 1

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. [ ] Claim numbers ..., because they relate to subject matter not required to be searched by this Authority, namely:

2. [ ] Claim numbers , because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. [ ] Claim numbers ..., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4 (a):

## VI. [ ] OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING 2

This International Searching Authority found multiple inventions in this international application as follows:

1. [ ] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. [ ] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. [ ] No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. [ ] As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

## Remark on Protest

[ ] The additional search fees were accompanied by applicant's protest.

[ ] No protest accompanied the payment of additional search fees.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON  
INTERNATIONAL APPLICATION NO. PCT/AU 90/00488

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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Patent Document  
Cited in Search  
Report

Patent Family Members

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EP 287433                  FR 2614010

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EP 327948                  DE 3804090

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END OF ANNEX